Source: Iowa Natural Resources Conservation Service

RAIN GARDENS

Susan Kenzle, RLA, LI
Watershed Protection Department
City of Austin

City of Austin WATERSHED PROTECTION

Watershed Protection Department (WPD)

Missions: water quality protection and erosion control

DIVISIONS

- **Environmental Resource Management**
- Field Operations
- Watershed Engineering
- Watershed Policy and Planning

Sustainable Stormwater Solutions Section

Design, implement & evaluate engineered systems that reduce pollution & erosion in our waterways. Stormwater is a resource.

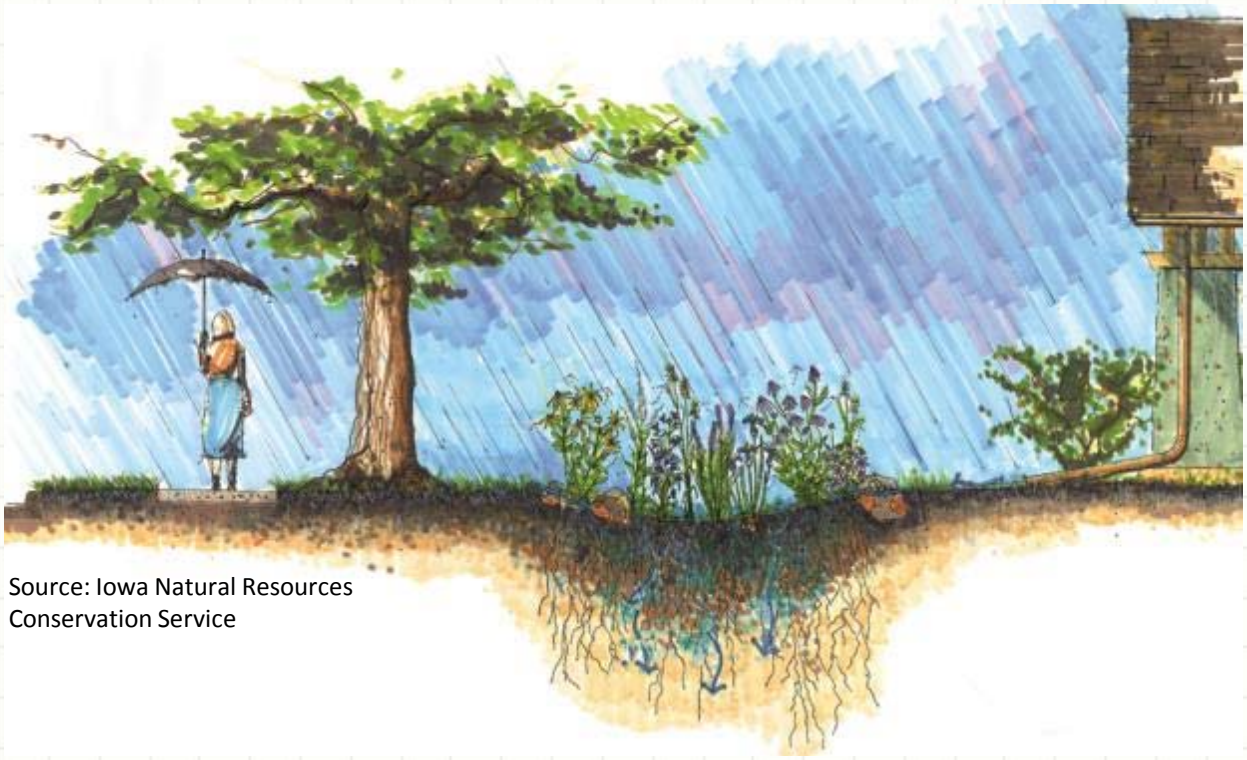
- Water quality control retrofits
- Stream restoration

A rain garden is one of 7 “green stormwater Infrastructure” practices recognized by WPD as eligible for water quality credit

Rain Garden Topics

1. What and Why
2. Types
3. Plants
4. Maintenance

Rain Gardens: What & Why



Source: Iowa Natural Resources Conservation Service

Rain Garden: What?

A shallow, vegetated depression designed to absorb and filter runoff from hardscapes like roads, sidewalks, driveways, roofs

Rain Garden: Why?

- To slow and clean stormwater: reduces erosion and flooding, protects water quality by filtering pollutants
- To minimize potable water use on landscapes
- Increase baseflow in creeks and groundwater recharge by enhancing water infiltration into the soil (rather than overland)
- To support habitat for birds and butterflies
- Aesthetics

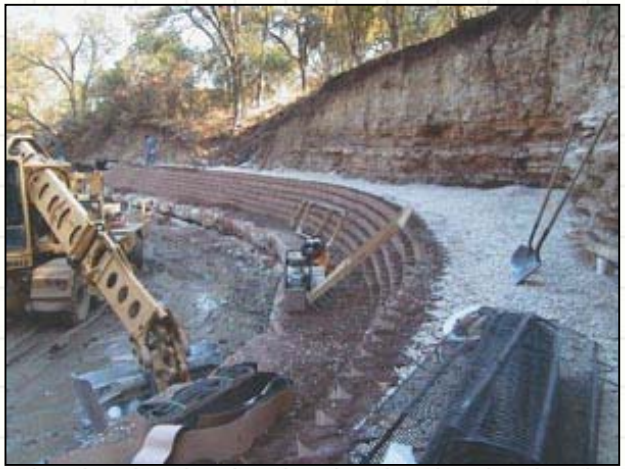
Rain Garden: Why?

To capture & infiltrate stormwater runoff

Stormwater enters inlet

Flooding of West Bouldin Creek into development

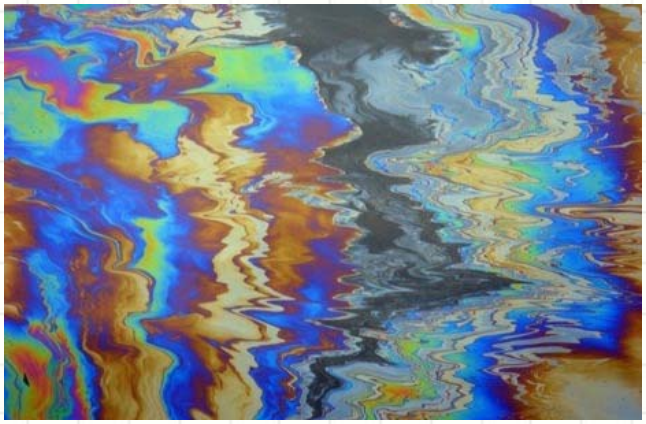
Erosion: West Bouldin Creek



Erosion Repair: West Bouldin Creek

Rain Garden: Why?

To filter stormwater and remove pollutants from various sources



Source:treehugger.org

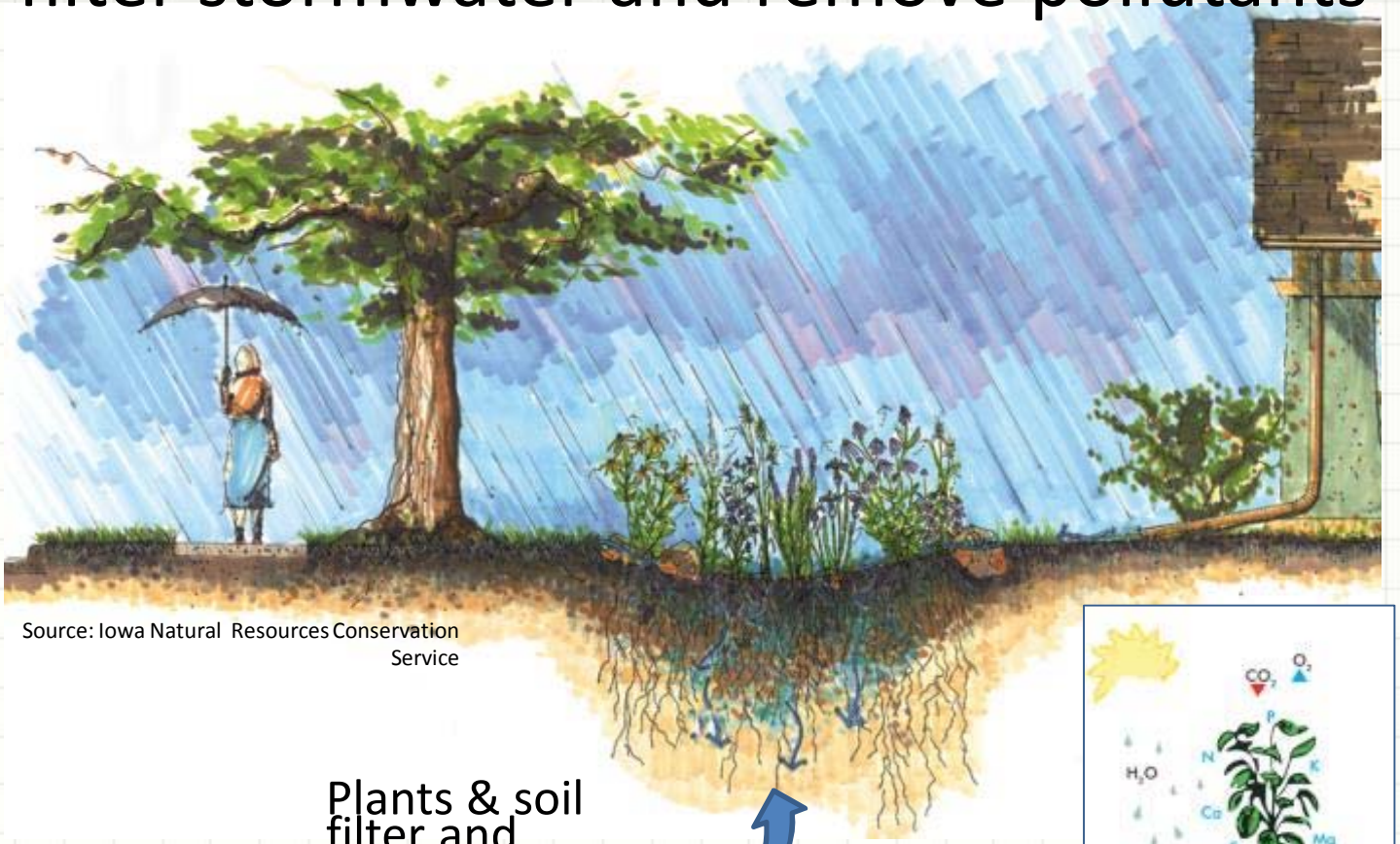
Source:mass.gov/dep/water/resources

Source:delcocd.org

Source:ristormwatersolutions.org

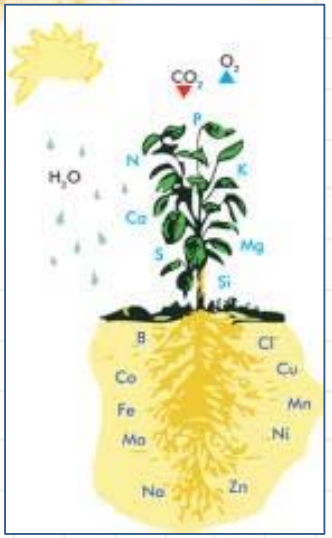
Rain Garden: Why?

To filter stormwater and remove pollutants



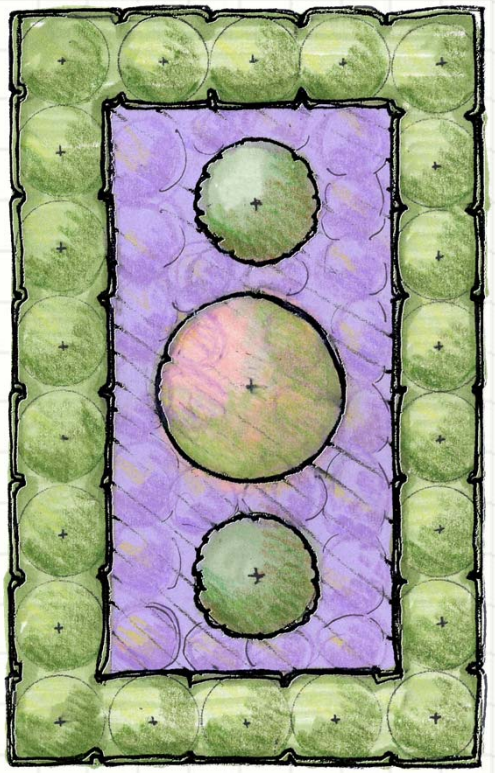
Source: Iowa Natural Resources Conservation Service

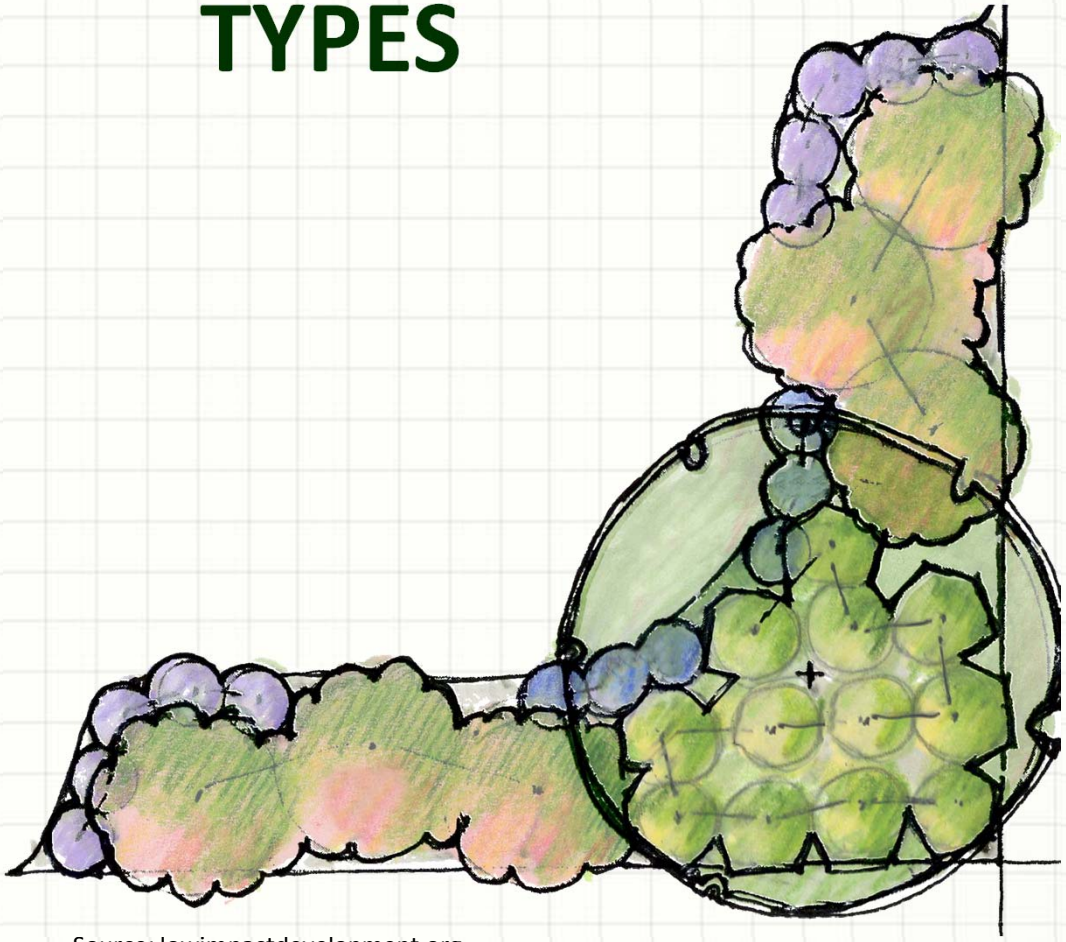
Plants & soil filter and remove pollutants



Source:greenhousecanada.com

RAIN GARDENS: TYPES





Source: lowimpactdevelopment.org

Rain Gardens: info. sources

The City of Austin has <u>two</u> sources of information on Rain Gardens:

- City of Austin Environmental Criteria Manual (**ECM**), Section 1.6.7
  - Commercial, Multi-family, Civic, and Public R.O.W.

- **Grow Green** (residential)

grow green

earth-wise guide to

Rain Gardens

Keeping Water on the Land

what is a rain garden?

A rain garden is a shallow, vegetated depression designed to absorb and filter runoff from hard (impervious) surfaces like roofs, sidewalks, and driveways. Rain gardens are usually planted with colorful native plants and grasses. They not only provide an attractive addition to the yard, but also help to conserve water and protect our water quality.

how does a rain garden help?

As Austin becomes increasingly urbanized, native landscapes are replaced with impervious surfaces that prevent rainwater from soaking into the ground. Stormwater quickly runs off these hard surfaces, picking up pollutants from the land and carrying them to our creeks. This rapidly flowing water also increases the chances of flooding and erosion.

The goal of a rain garden is to keep water on the land. Rain gardens, with their shallow depressions, capture stormwater and provide for natural infiltration into the soil. This provides water for the plants and helps maintain a constant flow of water in our streams through groundwater. They also help filter our pollutants including fertilizers, pesticides, oil, heavy metals and other chemicals that would otherwise reach our creeks through storm drains or drainage ditches. By reducing the quantity of water that runs off your property, rain gardens help lower the risk of flooding and erosion.

growgreen.org

Austin Parks and Recreation - 919 West 28th Street

Create A Rain Garden in Six Steps

1 Find the Right Location

- Observe the flow of water from rooftops, driveways or other hard surfaces and place the rain garden where this water collects
- Select an area on gently sloping or flat land
- Calculate the slope of your lawn (instructions on next page). The slope should be less than 10%
- If possible, pick a spot in full to partial sun. Shady locations will still work, but the options for flowering plants are more limited in the shade
- Make sure that any overflow will not cause unintended runoff to a neighbor's property or other structure
- If drainage-related problems are occurring (e.g. foundation problems, erosion or flooding), consider placing the rain garden at least 10' away from the structure
- Avoid areas with utility lines. Be sure to call 1-800-DIG-TESS (344-8377) to identify the location of underground utilities – the service is free

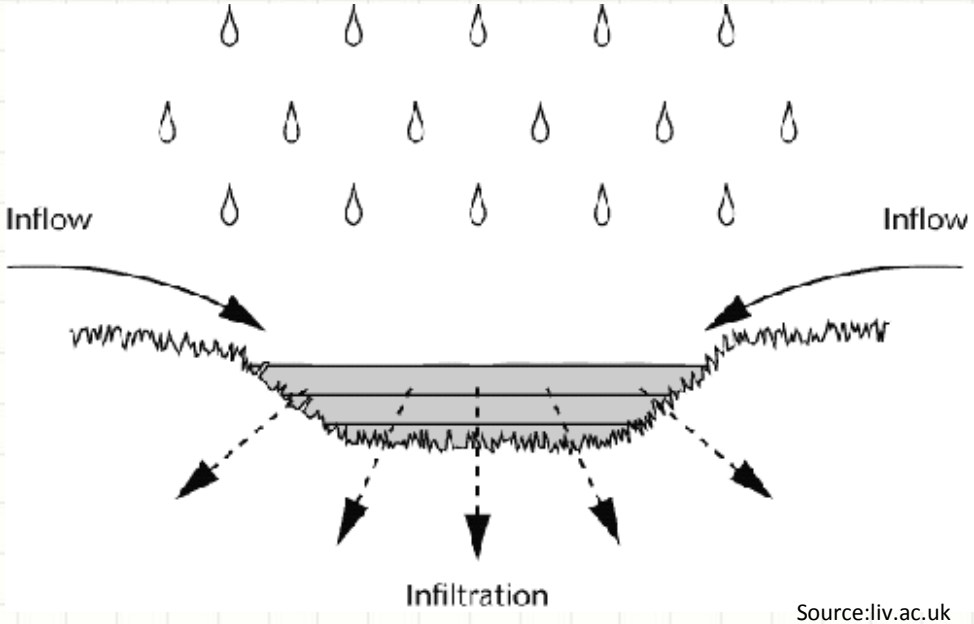
Rain Gardens: Types

City of Austin ECM 1.6.7 H details three types of **non-residential** Rain Gardens:

- Full Infiltration
- Partial Infiltration
- Filtration with no infiltration

Residential rain gardens are not governed by the ECM.

- Full infiltration.



Source:liv.ac.uk

Rain Gardens

SOIL & WATER INFILTRATION

- Type of existing soil and its **infiltration rate** effects the type of rain garden.
- Infiltration time: non-residential (48 hrs max.) and residential (24 hrs max.).
- Non-residential rain gardens: native soil or biofiltration media, underdrain system.

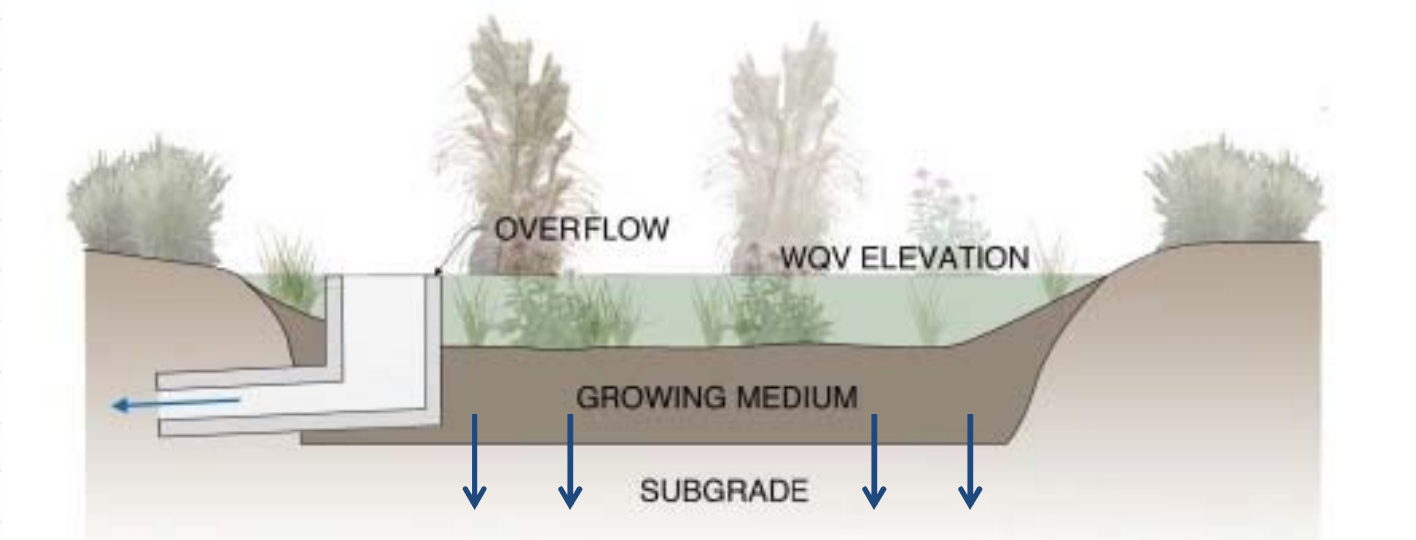
- Rain garden growing medium characteristics:
  - Have sufficient water holding capacity;
  - Be able to sustain healthy microorganism population.

- **Simple**
- **Cheap**
- **Direct Infiltration Rate**

Simple Infiltration test

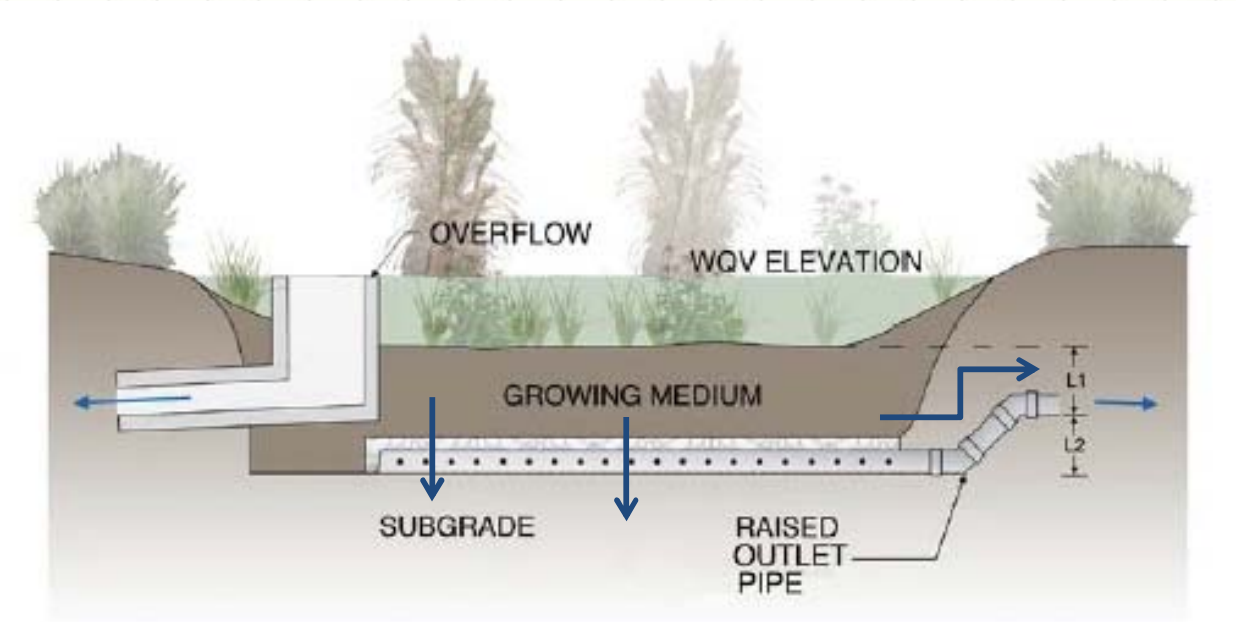
Double ring Infiltration test

Rain Garden Types – Full Infiltration



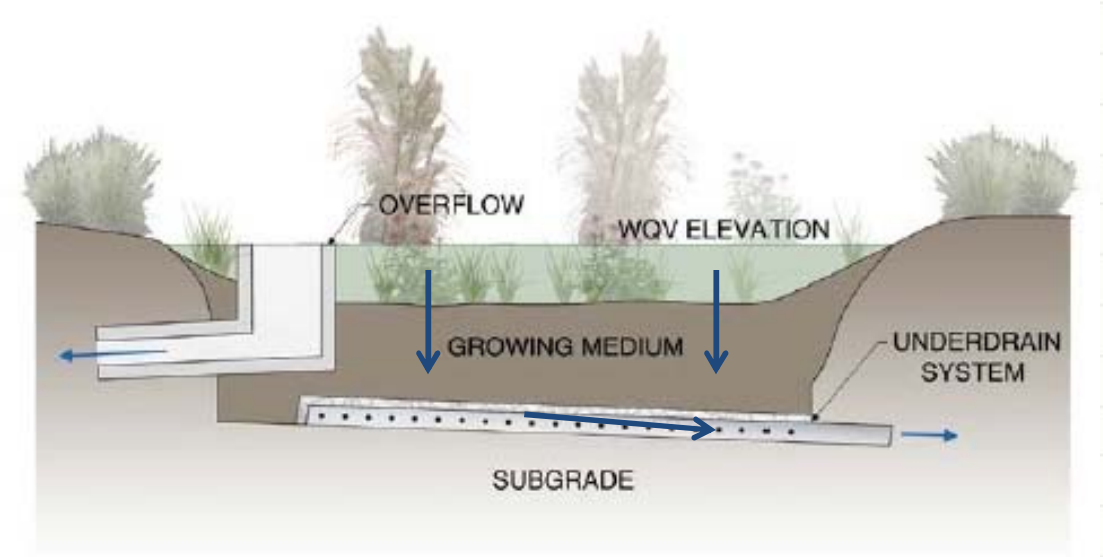
- Captures and fully infiltrates runoff
- The infiltration capacity of the site soils are used to reduce stormwater runoff volume and associated pollutants
- No underdrain

Rain Garden Types – Partial Infiltration



- Captures and treats runoff through a biofiltration bed, a special soil mix
- Stormwater exits this rain garden in 2 ways:
  - via a raised outlet pipe
  - by infiltration into the underlying soil

Rain Garden Types – Filtration with no Infiltration



- Captures and conveys runoff through:
  - biofiltration bed
  - underdrain system
- No infiltration into underlying soil.

Rain Garden Types - Residential

grow green

earth-wise guide to

Rain Gardens

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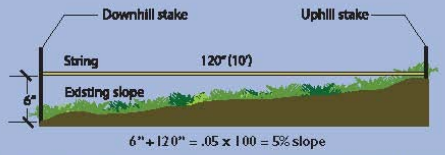
How to Calculate the Slope of Your Lawn



6" ÷ 120" = .05 x 100 = 5% slope

1. Pound one stake in the ground at the uphill end of your rain garden site and pound another stake in the ground at the downhill end. The stakes should be about 10' apart
2. Tie a string to the bottom of the uphill stake and run the string to the downhill stake
3. Using a carpenter's level, make the string horizontal and tie the string to the downhill stake at that height
4. Measure the distance *in inches* between the two stakes
5. Now measure the height in inches on the downhill stake between the ground and string
6. Divide the height between the ground and string by the distance between the two stakes and multiply the result by 100 to find the lawn's percent slope

2 Test the Soil

- When soil is saturated (after you've irrigated or it has rained,) dig a hole 6" in diameter and no more than 12" deep in the area you'd like to put the rain garden. *(Ideally, you want to be sure there is at least 12" of soil above bedrock)*

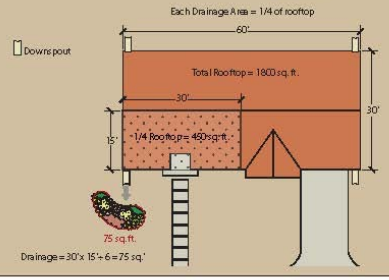
- Insert a ruler and fill the hole with water up to the 6" mark. Time how long it takes the water to be absorbed into the ground
- The water should absorb in less than 24 hours. If there is still water in the hole after 24 hours, then the site is not suitable for a rain garden
- If your soil meets the infiltration test requirements, then you are ready to build the garden!

3 Calculate the Size and Shape of Your Garden

- Through observation, locate the roof area or other impervious surfaces that will contribute runoff to your rain garden
- Use a tape measure to estimate the size of the area. This doesn't require climbing on the roof! Standing on the ground, measure the footprint of the area you are interested in (the area taken up by your house if you were looking down from above)
- Once you have estimated the length and width, multiply the two measurements to get the area of the impervious surface in square feet
- Finally, divide this area by 6. This calculation tells you how large the rain garden should be to hold 1" of runoff in a rain garden that is 6" deep *(see options below)*

Impervious Surface Area (sq. ft.)	Rain Garden (sq. ft.)	Size Options (ft. x ft.)
200	33	3x11; 4x9
400	67	5x14; 7x10
600	100	5x20; 8x12
800	133	6x22; 10x13
1000	167	6x28; 10x17

- More than one rain garden might be needed to collect all the runoff from your roof
- Rain gardens aren't just functional - they can be attractive, creative and fun!



- Native soil
- No underdrain or connection to stormwater system

Rain Gardens: Examples

- Rain gardens across the city take various forms

➢ Commercial ➢ Multi-family ➢ Civic ➢ Public R.O.W.	Full Infiltration Partial Infiltration Filtration
➢ Residential	Full Infiltration

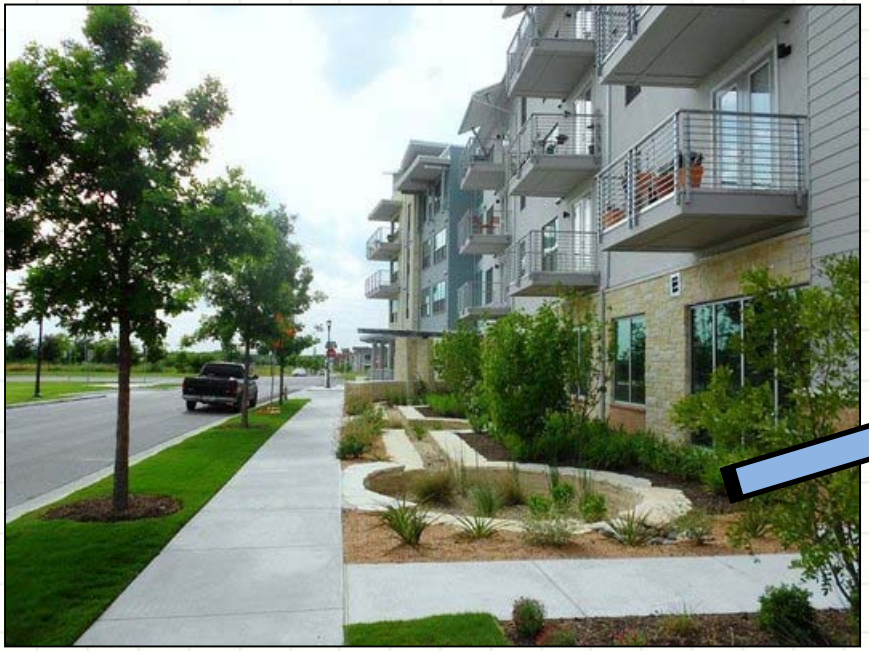
Rain Garden Examples - Commercial

W 34th Street

3300 N IH35 – Aveda Institute

Zach Scott Theater

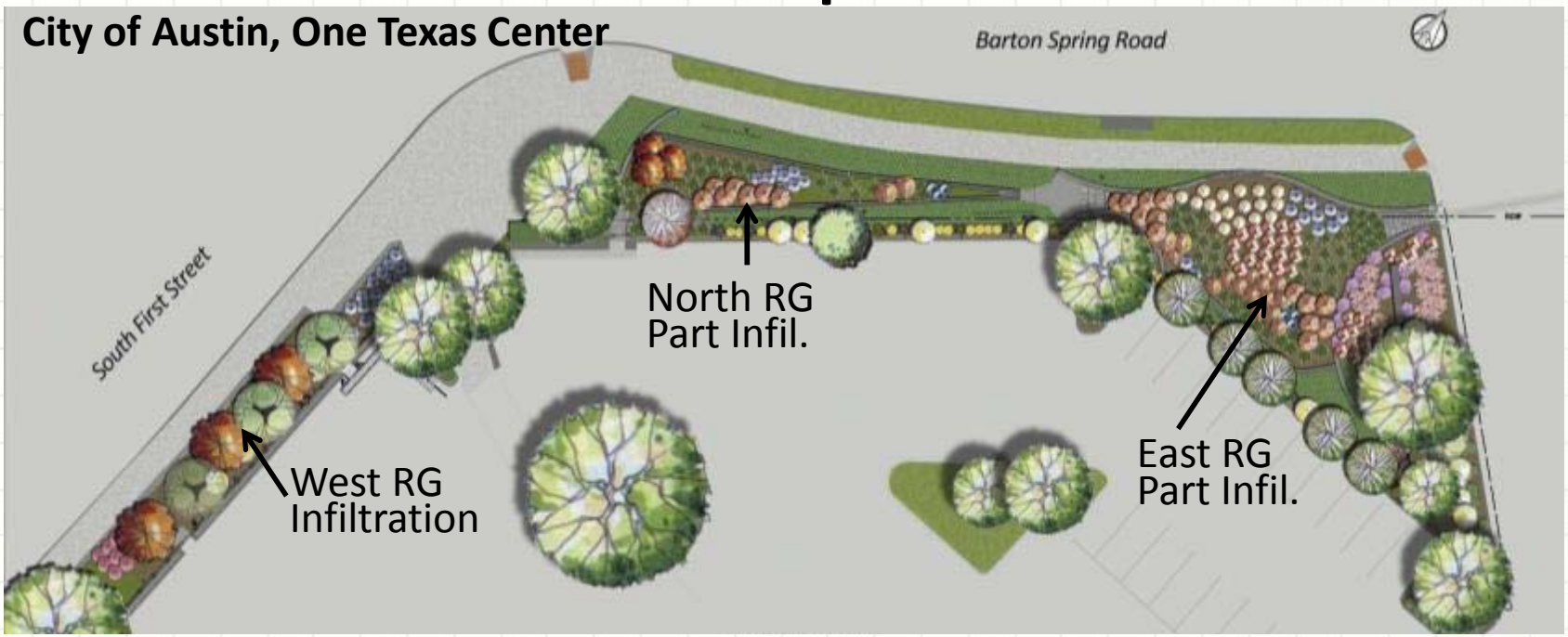
Rain Garden Examples – Multi-family

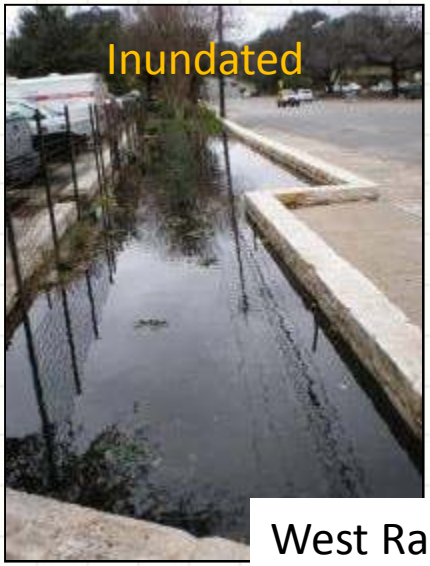


Wildflower Terrace, Mueller

Wildflower Terrace, Mueller

Rain Garden Examples - Civic





West Rain Garden

OTC Rain Garden Facts:

- 1.5 AC drainage area;
- 761,615 gal of treated stormwater treated in an average year;
- Approximately 1,000 lbs total suspended solids prevented from entering East Bouldin Creek and Lady Bird Lake.

Rain Garden Examples - Civic

NW Recreation Center

Stacy Park

NW Recreation Center

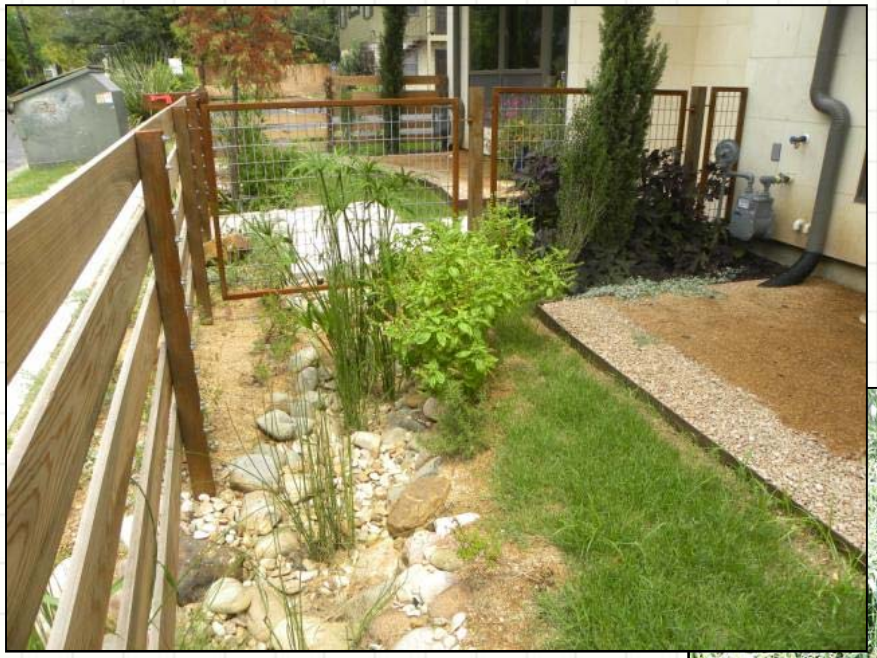
Rain Garden Examples – R.O.W.

10th & Rio Grande

Grover Ave.

Todd Lane (future)

Rain Gardens Examples - Residential



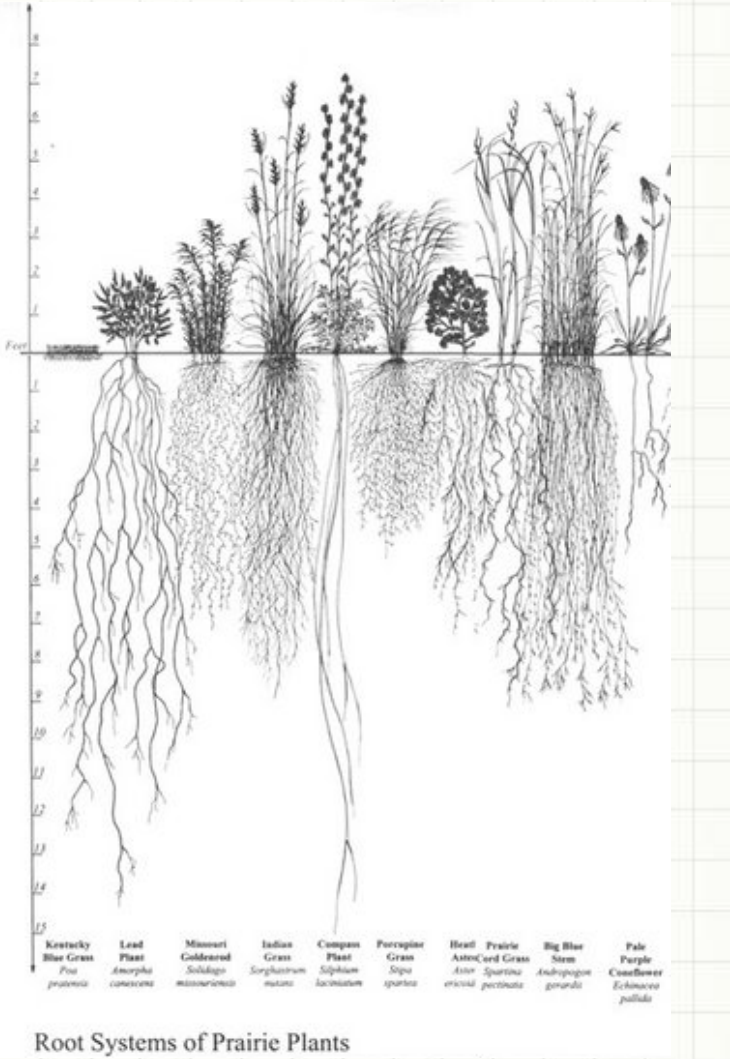
Solvita Townhomes, Harmon Ave.

Bellamy Residence

Rain Gardens: Plants

Rain Gardens: Plants

- **Plants are an essential component** – they filter and clean stormwater, and stabilize the soil
- Use Native or adapted plants
- Use Drought-tolerant plants
- Plants with fibrous root systems are very beneficial
- Plant roots will maintain and increase soil porosity
- Avoid plants that require well-drained soils
- Diversity of plant types



Root Systems of Prairie Plants

Rain Gardens: Plants

PLANT INFORMATION SOURCES

- **Non-residential** follow ECM 1.6.7C, Biofiltration

Table 1.6.7.C-2
Recommended Plant Species

Botanical Name	Common Name
Andropogon gerardii	Big bluestem
Buchloe dactyloides	Buffalo grass
Elymus canadensis	Canada wildrye
Helianthus maximiliani	Maximilian sunflower
Muhlenbergia capillaris	Gulf coast muhly
Muhlenbergia filipes	Purple muhly
Muhlenbergia dumosa	Pine muhly
Muhlenbergia lindheimeri	Big muhly
Muhlenbergia rigens	Deer muhly
Panicum virgatum	Switchgrass
Penstemon tenuis	Brazos penstemon
Physostegia spp.	Obedient plant
Schizachyrium scoparium	Little bluestem
Sorghastrum nutans	Indian grass
Sporobolus airoides	Alkali sacaton
Stenotaphrum secundatum	St. Augustine grass
Tripsacum dactyloides	Eastern gama grass

- Turf grass (e.g., buffalo grass)
- Groundcovers
- Small trees

Other with approval

- Perennials
- Shrubs
- Grasses, Sedges

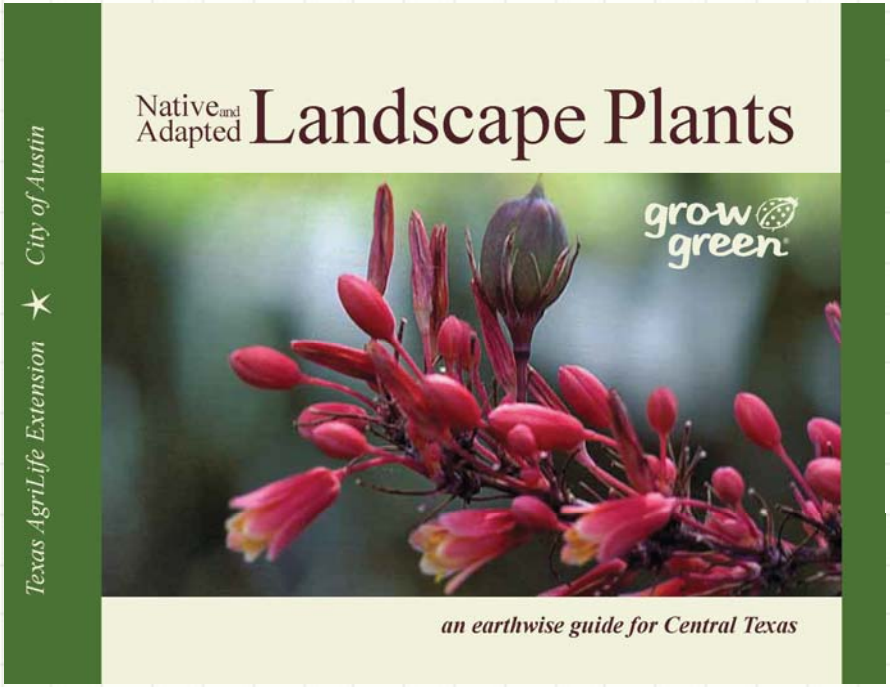
Table 1.6.7.C-3
Vegetation That Is Not Permitted For Planting

Botanical Name	Common Name	Comments
Arundo donax	Giant reed	Tall invasive grass
Bothriochloa ischaemum var. songarica	'King Ranch' bluestem (KR bluestem)	Invasive grass
Cortaderia selloana	Pampas grass	Potentially invasive
Cytisus scoparius	Scotch broom	Invasive shrub
Eragrostis curvula	Weeping love grass	Invasive grass
Imperata cylindrica	Cogon grass	Invasive grass
Miscanthus sinensis	Japanese silver grass	Invasive grass
Pennisetum setaceum	Fountain grass	Invasive grass
Phragmites australis	Common reed	Tall invasive grass
Sapium sebiferum	Chinese tallow	Invasive tree

Rain Gardens: Plants

PLANT INFORMATION SOURCES

- **Residential**
  - Grow Green brochure
  - Landscape Plants guide



Suggested Plants for Central Texas Rain Gardens

Tall Plants

Cherry Laurel
Eastern Gamagrass
Maximilian Sunflower
Possumhaw Holly
Red Buckeye
Switchgrass

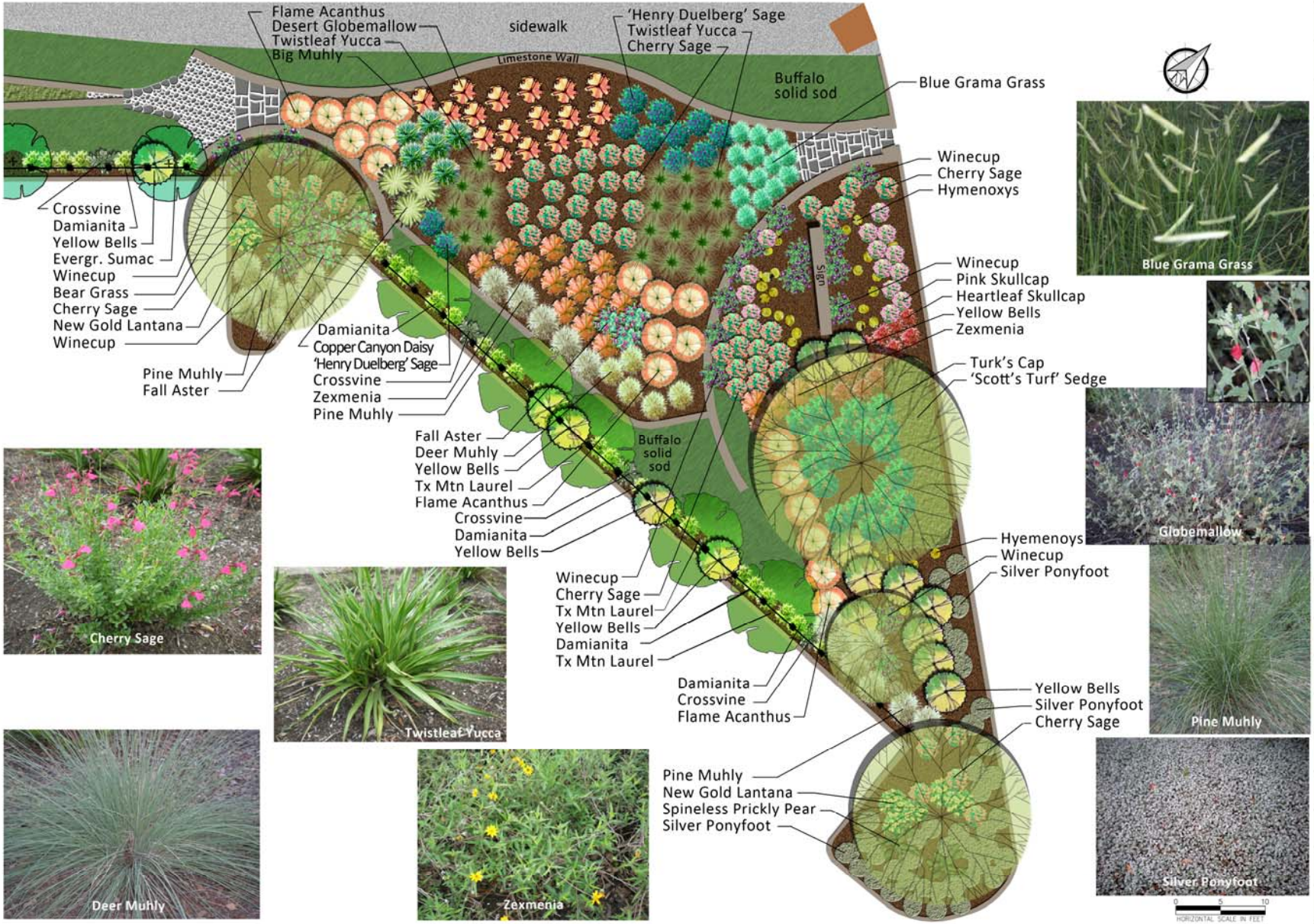
Medium Plants

American Beautyberry
Bicolor Iris
Big Bluestem
Big Muhly
Bushy Bluestem
Cherokee Sedge
Chili Pequin
Indian Grass
Little Bluestem
Obedient Plant
Prairie Wildrye
Purple Muhly
Turks Cap

Low Plants

Black-eyed Susan
Blue Mistflower
Cherry Sage
Coreopsis
Deer Muhly
Gulf Coast Muhly
Gulf Coast Penstemon
Horseherb
Inland Sea Oats
Liriope
Meadow Sedge
Missouri Violet
Monkey Grass
Pigeonberry
River Fern
Spiderwort
Tropical Sage
Water Clover
Zexmenia

Rain Gardens: Plants at OTC Rain Gardens



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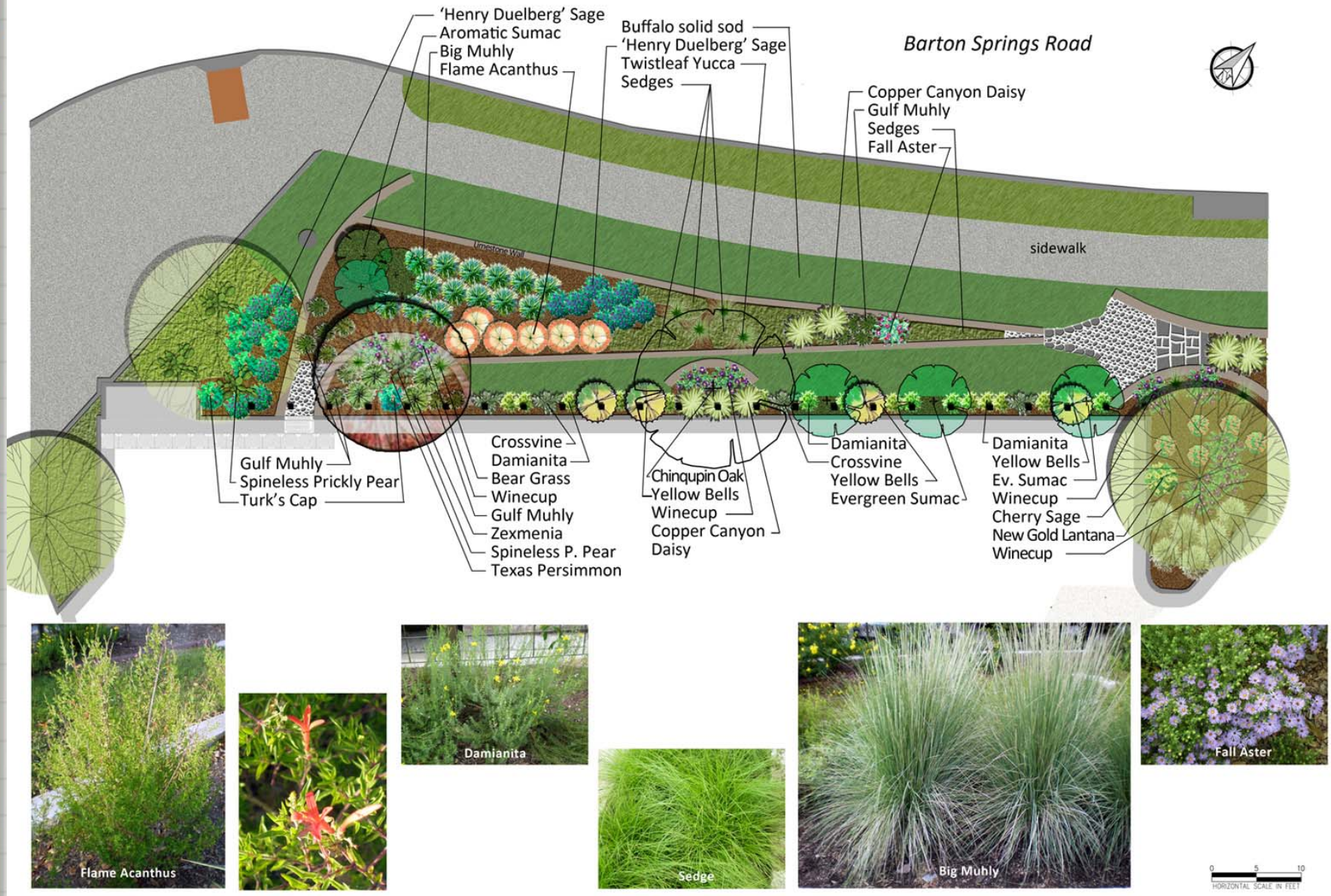


Rain Gardens: Maintenance

Source: sbgardendesign.wordpress.com

Rain Gardens: Consider Maintenance During Design

- Select native vegetation whenever possible.
- Plan vegetation throughout the entire garden.
- Plants should predominate over mulch or gravel soil stabilization. Proper plant spacing is important.
- Crushed granite & other materials with fines should not be used as they can clog the system, preventing proper drainage.
- If pedestrian traffic is expected, provide stepping stones to direct walking.
- Plant spiny vegetation along garden edge to discourage pedestrian use.
- Design the garden depression to be as shallow as possible to facilitate mowing and reduce erosion.
- Design with maintenance in mind.

Rain Gardens: Post-construction Maintenance

Inflow



- ✓ Keep curb cut or other inflow device clear of leaves, trash, sediment, media

- ✓ Remove excess sediment from inside inlet to allow proper flow into rain garden

Rain Gardens: Post-construction Maintenance

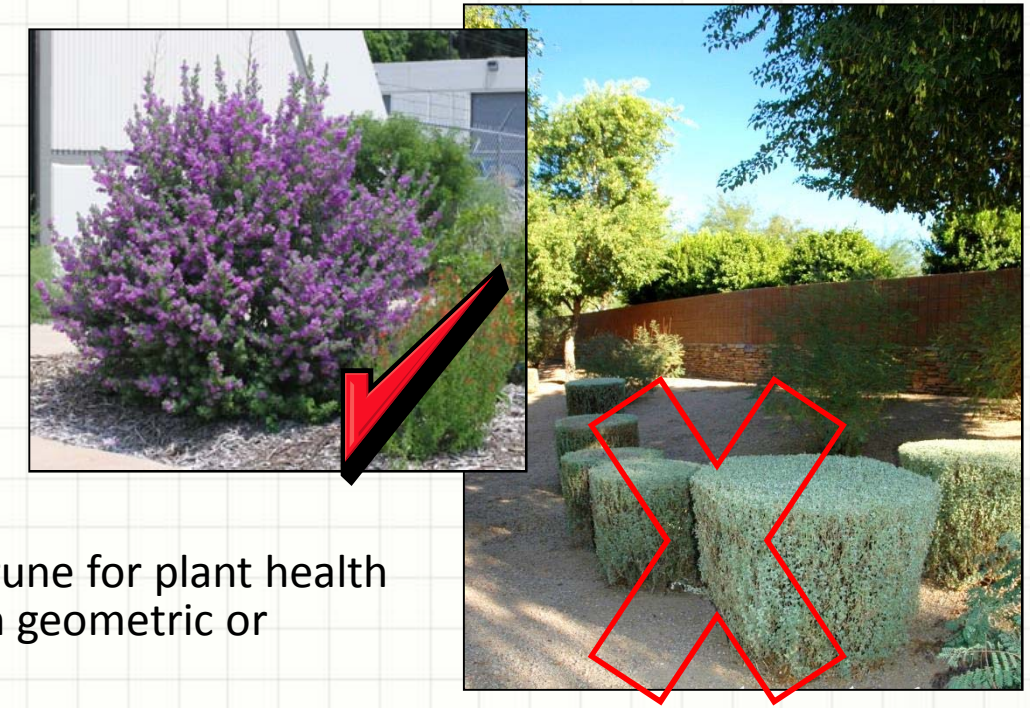
Plants, Mulch, Soil

- ✓ Replace dead or diseased vegetation.
  95% living veg. is required.
- ✓ Maintain mulch depth & coverage.
- ✓ No bare areas over 10 s.f.
- ✓ Repair erosion, animal burrows.

- ✓ Remove or control weeds with minimal herbicide, pesticide use.
- ✓ IPM

Rain Gardens: Post-construction Maintenance

Plants



- ✓ Prune excessive growth or prune for plant health
- ✓ Do not prune native plants in geometric or unnatural shapes

- ✓ Mow sod-forming grasses no shorter than 3”

Rain Gardens: Post-construction Maintenance

Plants, Irrigation

- ✓ Tree stabilization should be removed after 1 year

- ✓ Minimize irrigation use but keep plants adequately water during establishment and drought
- ✓ Check systems periodically for proper function, leaks

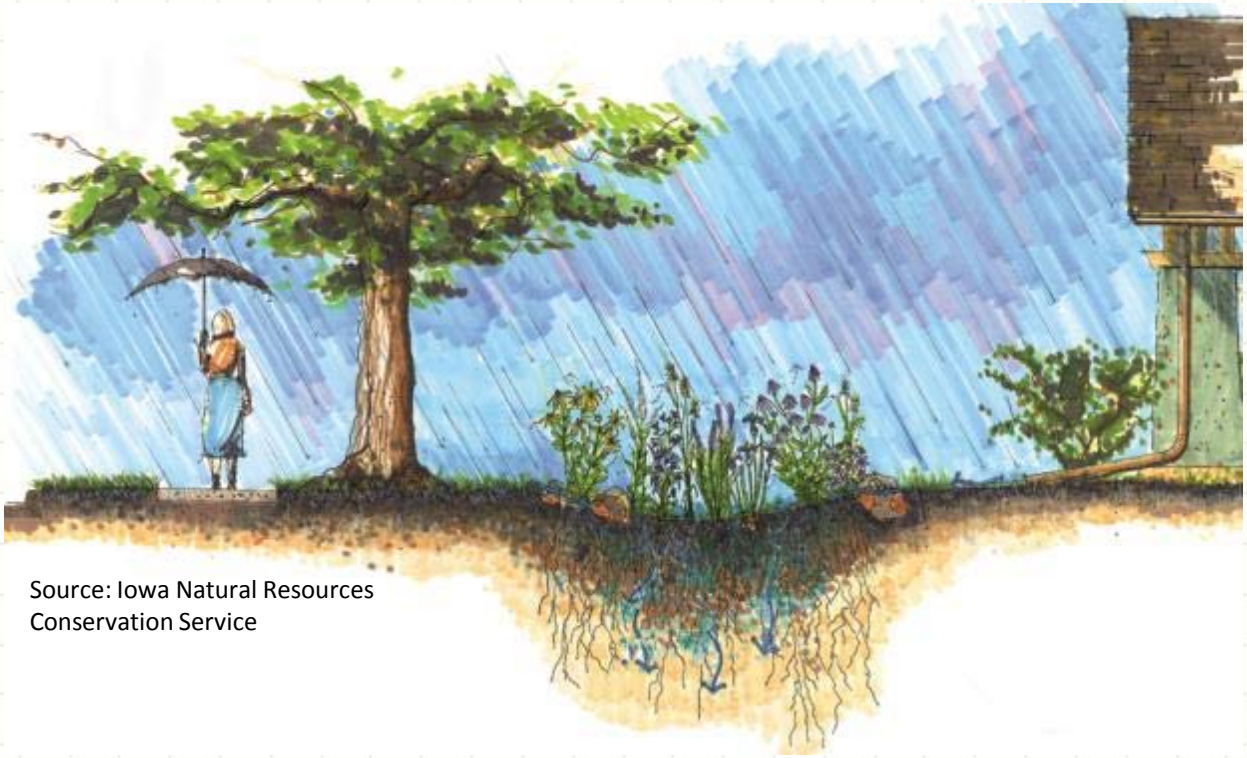
Rain Gardens: Post-construction Maintenance

Trash, Dead Animals, Standing Water

✓ Remove dead animals, pet waste, and trash regularly

✓ Water standing for over 48 hrs may signal clogging & become a mosquito breeding area

QUESTIONS?



Source: Iowa Natural Resources Conservation Service